UK Met Office operational assimilated data: NetCDF metadata change

From the 11th of July 2017 an updated version of the UK Met Office operational model has been in use. This upgrade has an increased horizontal and vertical resolution, see the documentation at http://catalogue.ceda.ac.uk/uuid/6416b658532b42d2b92a0e495f095aaf for full details.

Up until 11th of July 2017 the operational assimilated data held on the CEDA archives was available in the Met Office "pp" format and also a converted NetCDF format. The Convsh tool was used to handle this conversion. In order to manage the larger file sizes from the 11th of July 2017 the raw "pp" data are converted to NetCDF4 using CF-Python (https://cfpython.bitbucket.io/). There are some changes in the NetCDF metadata as a result.

Below is an example of an `ncdump –h` on two files (prior to the upgrade in the resolution) to illustrate the changes in the NetCDF metadata.

NetCDF metadata prior to 11-07-2017, conversion with Convsh:

```
netcdf ukmo-nwp-strat_gbl-std_2017050112_u-v-gph-t-w {
dimensions:
	longitude = 1536 ;
	latitude = 1153 ;
	p = 31 ;
	t = UNLIMITED ; // (1 currently)
	longitude_1 = 1536 ;
	latitude_1 = 1152 ;
variables:
	float longitude(longitude) ;
		longitude:long_name = "longitude" ;
		longitude:standard_name = "longitude" ;
		longitude:units = "degrees_east" ;
		longitude:point_spacing = "even" ;
		longitude:modulo = " " ;
	float latitude(latitude) ;
		latitude:long_name = "latitude" ;
		latitude:standard_name = "latitude" ;
		latitude:units = "degrees_north" ;
		latitude:point_spacing = "even" ;
	float p(p) ;
		p:long_name = "Pressure" ;
		p:units = "mbar" ;
		p:positive = "down" ;
	float t(t) ;
		t:long_name = "t" ;
		t:units = "days since 2017-05-01 12:00:00" ;
		t:time_origin = "01-MAY-2017:12:00:00" ;
	float u(t, p, latitude, longitude) ;
		u:source = "Unified Model Output (Vn10.4):" ;
		u:name = "u" ;
		u:title = "Westerly component of wind  u" ;
		u:date = "01/05/17" ;
		u:time = "12:00" ;
		u:long_name = "Westerly component of wind  u" ;
		u:standard_name = "eastward_wind" ;
		u:units = "m s-1" ;
		u:missing_value = 2.e+20f ;
		u:_FillValue = 2.e+20f ;
		u:valid_min = -105.25f ;
```

```
            u:valid_max = 116.375f ;
        float v(t, p, latitude, longitude) ;
            v:source = "Unified Model Output (Vn10.4):" ;
            v:name = "v" ;
            v:title = "Southerly component of wind v" ;
            v:date = "01/05/17" ;
            v:time = "12:00" ;
            v:long_name = "Southerly component of wind v" ;
            v:standard_name = "northward_wind" ;
            v:units = "m s-1" ;
            v:missing_value = 2.e+20f ;
            v:_FillValue = 2.e+20f ;
            v:valid_min = -79.875f ;
            v:valid_max = 84.875f ;
        float longitude_1(longitude_1) ;
            longitude_1:long_name = "longitude" ;
            longitude_1:standard_name = "longitude" ;
            longitude_1:units = "degrees_east" ;
            longitude_1:point_spacing = "even" ;
            longitude_1:modulo = " " ;
        float latitude_1(latitude_1) ;
            latitude_1:long_name = "latitude" ;
            latitude_1:standard_name = "latitude" ;
            latitude_1:units = "degrees_north" ;
            latitude_1:point_spacing = "even" ;
        float ht(t, p, latitude_1, longitude_1) ;
            ht:source = "Unified Model Output (Vn10.4):" ;
            ht:name = "ht" ;
            ht:title = "Height" ;
            ht:date = "01/05/17" ;
            ht:time = "12:00" ;
            ht:long_name = "Height" ;
            ht:standard_name = "geopotential_height" ;
            ht:units = "m" ;
            ht:missing_value = 2.e+20f ;
            ht:_FillValue = 2.e+20f ;
            ht:valid_min = -411.f ;
            ht:valid_max = 79718.f ;
        float temp(t, p, latitude_1, longitude_1) ;
            temp:source = "Unified Model Output (Vn10.4):" ;
            temp:name = "temp" ;
            temp:title = "Temperature T" ;
            temp:date = "01/05/17" ;
            temp:time = "12:00" ;
            temp:long_name = "Temperature T" ;
            temp:standard_name = "air_temperature" ;
            temp:units = "K" ;
            temp:missing_value = 2.e+20f ;
            temp:_FillValue = 2.e+20f ;
            temp:valid_min = 167.5f ;
            temp:valid_max = 316.25f ;
        float dz_dt(t, p, latitude_1, longitude_1) ;
            dz_dt:source = "Unified Model Output (Vn10.4):" ;
            dz_dt:name = "dz_dt" ;
            dz_dt:title = "Vertical velocity  (= dz/dt)" ;
            dz_dt:date = "01/05/17" ;
            dz_dt:time = "12:00" ;
            dz_dt:long_name = "Vertical velocity  (= dz/dt)" ;
            dz_dt:standard_name = "upward_air_velocity" ;
            dz_dt:units = "m s-1" ;
            dz_dt:missing_value = 2.e+20f ;
            dz_dt:_FillValue = 2.e+20f ;
            dz_dt:valid_min = -1.779297f ;
            dz_dt:valid_max = 2.935547f ;

// global attributes:
            :history = "Thu May  4 08:01:07 BST 2017 - CONVSH V1.93 13-October-
2015" ;
```

NetCDF metadata after 11-07-2017, conversion with cf-python:

```
netcdf ukmo-nwp-strat_gbl-std_2017050112_u-v-gph-t-w.nc {
dimensions:
	air_pressure = 31 ;
	latitude = 1152 ;
	bounds2 = 2 ;
	longitude = 1536 ;
	latitude_1 = 1153 ;
	longitude_1 = 1536 ;
variables:
	double time ;
		time:units = "days since 2017-1-1" ;
		time:standard_name = "time" ;
		time:calendar = "gregorian" ;
		time:axis = "T" ;
	double air_pressure(air_pressure) ;
		air_pressure:units = "hPa" ;
		air_pressure:positive = "down" ;
		air_pressure:standard_name = "air_pressure" ;
		air_pressure:axis = "Z" ;
	double latitude_bounds(latitude, bounds2) ;
	double latitude(latitude) ;
		latitude:units = "degrees_north" ;
		latitude:standard_name = "latitude" ;
		latitude:bounds = "latitude_bounds" ;
		latitude:axis = "Y" ;
	double longitude_bounds(longitude, bounds2) ;
	double longitude(longitude) ;
		longitude:units = "degrees_east" ;
		longitude:standard_name = "longitude" ;
		longitude:bounds = "longitude_bounds" ;
		longitude:axis = "X" ;
	float air_temperature(air_pressure, latitude, longitude) ;
		air_temperature:_FillValue = -1.073742e+09f ;
		air_temperature:coordinates = "time" ;
		air_temperature:long_name = "TEMPERATURE ON P LEV/P GRID" ;
		air_temperature:standard_name = "air_temperature" ;
		air_temperature:cell_methods = "time: point" ;
		air_temperature:stash_code = "16203" ;
		air_temperature:units = "K" ;
		air_temperature:um_stash_source = "m01s16i203" ;
	double latitude_1_bounds(latitude_1, bounds2) ;
	double latitude_1(latitude_1) ;
		latitude_1:units = "degrees_north" ;
		latitude_1:standard_name = "latitude" ;
		latitude_1:bounds = "latitude_1_bounds" ;
		latitude_1:axis = "Y" ;
	double longitude_1_bounds(longitude_1, bounds2) ;
	double longitude_1(longitude_1) ;
		longitude_1:units = "degrees_east" ;
		longitude_1:standard_name = "longitude" ;
		longitude_1:bounds = "longitude_1_bounds" ;
		longitude_1:axis = "X" ;
	float eastward_wind(air_pressure, latitude_1, longitude_1) ;
		eastward_wind:_FillValue = -1.073742e+09f ;
		eastward_wind:coordinates = "time" ;
		eastward_wind:long_name = "U WIND ON PRESSURE LEVELS    B GRID" ;
		eastward_wind:standard_name = "eastward_wind" ;
		eastward_wind:cell_methods = "time: point" ;
		eastward_wind:stash_code = "15201" ;
		eastward_wind:units = "m s-1" ;
		eastward_wind:um_stash_source = "m01s15i201" ;
	float geopotential_height(air_pressure, latitude, longitude) ;
		geopotential_height:_FillValue = -1.073742e+09f ;
		geopotential_height:coordinates = "time" ;
		geopotential_height:long_name = "GEOPOTENTIAL HEIGHT ON P LEV/P GRID"
;
		geopotential_height:standard_name = "geopotential_height" ;
```

```
            geopotential_height:cell_methods = "time: point" ;
            geopotential_height:stash_code = "16202" ;
            geopotential_height:units = "m" ;
            geopotential_height:um_stash_source = "m01s16i202" ;
      float northward_wind(air_pressure, latitude_1, longitude_1) ;
            northward_wind:_FillValue = -1.073742e+09f ;
            northward_wind:coordinates = "time" ;
            northward_wind:long_name = "V WIND ON PRESSURE LEVELS    B GRID" ;
            northward_wind:standard_name = "northward_wind" ;
            northward_wind:cell_methods = "time: point" ;
            northward_wind:stash_code = "15202" ;
            northward_wind:units = "m s-1" ;
            northward_wind:um_stash_source = "m01s15i202" ;
      float upward_air_velocity(air_pressure, latitude, longitude) ;
            upward_air_velocity:_FillValue = -1.073742e+09f ;
            upward_air_velocity:coordinates = "time" ;
            upward_air_velocity:long_name = "W COMPNT (OF WIND) ON PRESSURE LEVS"
;
            upward_air_velocity:standard_name = "upward_air_velocity" ;
            upward_air_velocity:cell_methods = "time: point" ;
            upward_air_velocity:stash_code = "15242" ;
            upward_air_velocity:units = "m s-1" ;
            upward_air_velocity:um_stash_source = "m01s15i242" ;

// global attributes:
            :Conventions = "CF-1.5" ;
            :source = "UM vn1004" ;
            :history = "Converted from UM by cf-python v1.5.4.post4" ;
            :lbproc = "0" ;
            :runid = "aaaac" ;
            :lbtim = "11" ;
}
```